SIGMA XI QUARTERLY

VOL. 22 DECEMBER, 1934 NO. 4

THIRTY-FIFTH CONVENTION

PITTSBURGH, DECEMBER 28

STAGNER: RESEARCH AND PROFITS AND SERVICE

COKER: METHODS VS. PROBLEMS

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SIGMA XI QUARTERLY

VOL. 22 DECEMBER, 1934 NO. 4

WANTED

CAN ANY MEMBER OF THE SOCIETY SEND TO THE NATIONAL SECRETARY THE SIGMA XI QUARTERLY FOR 1921? AND FOR 1925?

THE THIRTY-FIFTH CONVENTION

The annual convention of our great society will be held in Pittsburgh, Friday, December 28, 1934. The program of events is as follows:

4.00 p.m. The Business Session. Patio, Schenley Hotel.

6.30 p.m. The Buffet Supper. Schenley Hotel.

8.30 p.m. The Thirteenth Annual Sigma Xi Lecture. Carnegie Hall.

Speaker: Prof. Earnest Albert Hooton, Harvard University.

Subject: Homo Sapiens, Whence and Whither.

THE BUSINESS SESSION

Following are a few of the important items of business at present on the agenda of the convention. Chapters are especially urged to communicate with the national secretary, before December 20, other matters which chapters may wish to have the convention consider. The national officers will find a place in the program for all business connected with the progress and activities of the national organization.

1. Formal Petitions for Charters for Chapters.
   a. Smith College, Northampton, Mass.
   b. Wesleyan University, Middletown, Conn.

2. Amendment to Constitution.

At the 34th convention the following amendment to the national constitution was proposed and discussed:

The Executive Committee is empowered to elect as associates in the Society students in institutions where there is no chapter of Sigma Xi who have shown marked excellence in two or more fields of science, pure or applied, and to provide for their initiation.

The discussion emphasized the following points:

a. If the amendment were adopted, selection of candidates could best be made by chapters neighboring to the institution in which the candidate had done his work;

b. Election and initiation of associates is now the responsibility of duly constituted chapters, and the responsibilities of the Executive Committee should not be increased to the extent of delegating to it the power to elect;

c. Such a "long distance" election as the amendment proposes is not desirable nor wise.

In accordance with the constitution, action on the proposal was necessarily postponed to the 35th convention.

3. The Semi-centennial Program.

It is probable that the permanent committee on this important event will present recommendations for the information and consideration of the convention. The permanent committee, appointed by President Parker, is as follows:

Chairman, President George Howard Parker.
Representing the Executive Committee, Edward Ellery, George B. Pegram.
Representing Sigma Xi Alumni, C. E. Davies.
Representing Industrial Research, W. R. Whitney.
Representing Cornell, F. K. Richtmeyer.

The committee already has many plans under consideration, and will welcome further suggestions from chapters.

4. Sigma Xi Certificates of Award in Commendation of Research.

The committee of award for this year is Prof. D. E. Minnich, chairman,

Prof. John D. Tate, and Prof. Samuel C. Lind, all from the University of Minnesota.

5. Sigma Xi Clubs and the National Organization.

It is expected that our thirty-one clubs will all be represented at the convention and that suggestions will be made as to ways to bring about a closer relation between the clubs and the national organization.

6. Election of Officers.

The convention will be called upon to name a member of the executive committee for the term of five years to succeed Prof. Leon J. Cole, whose term of office expires in January; and a member of the alumni committee for a like term to succeed Mr. C. E. Davies, whose term expires in January.

President Parker has named the following nominating committee: Prof. Harlow Shapley, Harvard University, chairman; Prof. C. W. Greene, University of Missouri; and Prof. Joseph K. Roberts, University of Virginia.

Chapters are asked to make nominations to the committee either direct or through the secretary's office. Nominations should be made not later than the second week in December, in order to have full consideration by the committee.

IMPORTANT

Chapters are urged to select as their delegates members who will be sure to be able to attend the business session of the convention. It is the opinion of the national officers that wherever possible the delegates should be members whose connection with the chapter is somewhat permanent, who have had experience in chapter and society affairs, and whom the chapter might choose as its representative on the National Committee of Arrangements for the Semi-Centennial. Each chapter is entitled to a representation of three delegates.

Will chapter secretaries send to the National Secretary the names of their delegates as soon as they are appointed, and provide each delegate with a statement of his appointment for presentation to the Committee on Credentials at the opening of the Convention.

THE THIRTEENTH SIGMA XI LECTURE

For a dozen years, one of the most valuable and important of the general meetings held in connection with the December convention of the American Association for the Advancement of Science has been the one conducted under the joint auspices of the Association and Sigma Xi. It has been, and is, the purpose of the Executive Committee of Sigma Xi to present on these occasions well-known scientists who take this opportunity to give to a large public the

first announcement of the results of their own work in their own field, and to cover as the years pass many fields of scientific endeavor. The list of lecturers is an illustrious one and the topics discussed represent a wide range of interests.

1922. Dr. Livingston Farrand, President of Cornell University, "The Nation and Its Health."
1923. Dr. Willis R. Whitney, Director of Research, the General Electric Company, "The Vacuum, There's Something in It."
1924. Dr. Frederick F. Russell, Director of the International Health Board, "War on Disease, Particularly Yellow Fever and Malaria."
1925. Dr. F. D. Farrell, President, Kansas State College, "A Desert Becomes a Garden."
1926. Herbert C. Hoover, then Secretary of Commerce, "The Nation and Science."
1927. Dr. Clarence Cook Little, then President, University of Michigan, "Opportunities for Research in Mammalian Genetics."
1928. Prof. Arthur Compton, University of Chicago, "What Is Light?"
1929. Prof. George Howard Parker, Harvard University, "Some Aspects of Human Biology."
1930. Dr. C. E. K. Mees, Director of Research, Eastman Kodak Company, "The Science of Photography."
1931. Dr. C. F. Hirshfeld, Director of Research, Detroit Edison Company, "Whose Fault?"
1932. Prof. Harlow Shapley, Harvard University, "Fact and Fancy in Cosmogany."
1933. Prof. Henry E. Sigerist, Johns Hopkins University, "The Foundation of Anatomy in the Renaissance."

For 1934 we are privileged to announce that Prof. Earnest A. Hooton, of Harvard University, will deliver the thirteenth lecture of this important series. Professor Hooton is well known in scientific circles in this country and in Europe for his work in physical anthropology and African ethnology and archeology. He is professor of anthropology at Harvard and curator somatol of the Peabody Museum. He is a member of the American Academy.

Professor Hooton announces as his subject "Homo Sapiens, Whence and Whither." The lecture will be delivered in Carnegie Hall, Friday evening, December 28, at 8.30.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE ANNUAL SCIENCE EXHIBITION

F. C. BROWN
Director

The Annual Science Exhibition is becoming more prominently the common feature at the annual meetings of the American Association for the Advancement of Science. This year a plan was laid out for double the amount of space occupied a year ago and this was all taken two months in advance of the opening date, December 27. It was necessary to create new space through the courtesy of Dr. E. R. Weidlein, the director of the Mellon Institute for Industrial Research.

This year the most distinguished workers in science in America will participate in the exhibition. Perhaps cosmic rays will lead in the completeness of the presentations and demonstrations. The following is a mere list of some of the demonstrations already arranged in cosmic rays under the chairmanship of W. F. G. Swann, director of the Bartol Research Foundation of the Franklin Institute:

(1) Counter system used for measuring cosmic ray intensities in different directions in the stratosphere (Swann and Locher).

(2) Counter system used for measuring cosmic ray intensities in different directions on Levado de Toluca, Mexico (T. H. Johnson).

(3) Apparatus for measuring variation of cosmic rays production with altitude (C. G. and D. D. Montgomery).

(4) Portable cloud expansion apparatus (G. L. Locher).

(5) Transparencies of nuclear phenomena (Swann, Locher, Ramsey, Montgomeries).

(6) Cosmic ray hodoscope (T. H. Johnson).

(7) Portable counter detector for cosmic rays, x-rays, and radioactive radiations.

(8) The new cosmic ray counting meter and one of the Model A instruments as used by Carpe and Koven on Mt. McKinley and later sent into the stratosphere with Settle and Fordney. The instrument is similar to the one now in use by Poulter and Fordney in the Antartica (A. H. Compton).

(9) Special apparatus for cosmic rays (R. A. Millikan).

Deuterium is receiving special attention under the chairmanship of Dr. F. G. Brickwedde and the Ohio Chemical Company is contributing to this display.

The Aluminum Company of America is arranging special furnishings in the lounge, where members of the Association will find a common meeting place. Tea will be served in this lounge.

There will be an exhibitors' dinner for about two hundred at 7.45 on the evening of December 26 in Webster Hall just across from the Mellon Institute building.

MOTIVATION OF SCIENTIFIC RESEARCH

ROSS STAGNER
University of Wisconsin

Psychology has too often in the past neglected the problem of motivation in favor of the simpler problems of mechanism. While it is, after all, much simpler to find out *how* a reaction comes about than *why* it comes about, we must grant that in the long run the latter is a much more significant problem.

Motivation may be approached in many ways. Experimentally one may work with animals, with children or with unsophisticated adults by placing them in situations which may be expected to arouse drives of some sort. Historically one may approach the problem by examining into the material conditions which appear to determine mass reactions of the human race. Biographically one may use the same technique with individuals. Autobiographically we approach the introspective report (or guess) of the person most immediately concerned.

Of all these, the experimental method is unquestionably the best where practical. In many cases it is not. As a substitute we have the method of controlled observation. This simply means that we attempt, by studying large numbers of individuals, to rule out the vitiating factors influencing each case because of the lack of labor..tory conditions.

Without attempting to gather any statistics on the point, I have tried to apply this method to the problem of motivation of scientific research workers.

A first question that may be asked is, what appeals are made to young students to enter the field of research? I think everyone who has been associated with a scientific laboratory knows that the urge most frequently presented to students is that they can do a great deal for the advancement of knowledge, which ultimately is thought of as service to humanity. In the medical professions the appeal to humanitarian impulses is direct; in others, more remote.

Another appeal which is often voiced is to the curiosity of the student. He may have touched just the edge of some problem, and be persuaded to go on with its investigation.

An appeal which I have heard used but rarely is to the desire for financial gain. In fact, the student is almost certain to be warned that he will not be able to expect a high salary, and in comparison with many commercial workers, will be underpaid. In general, it is probably safe to say that financial prospects constitute a deterrent rather than an urge to enter research.

Another "negative" factor is the social problem of the researcher. In many fields, particularly the exact sciences, long and late hours must be expected. The young man or woman who is devoted to parties and social life will find little time for them if he or she devotes his future to science.

These are urges and counter-urges affecting the prospective researcher. We may also consider the rewards which are actually offered to excellent workers in the field.

Here again we find that the financial factor lacks the importance often ascribed to it by a civilization which may be labeled "money-conscious." In our popular thinking we have come unawares to the conclusion that money is everything. Scientific research workers prove that it is not.

Perhaps the commonest reward given to distinguished research is membership in a learned society. Our society of Sigma Xi is the foremost of these. That this membership is a potent factor in promoting research can be attested by countless cases in the experience of almost every member of Sigma Xi. Honorary fellowships and honorary degrees are probably next most numerous as awards for distinguished contributions to knowledge.

Another form of reward is the paid fellowship which frees the holder from onerous duties, such as teaching, or which allows him to travel. Few holders of these fellowships take advantage of them to loaf; in fact, my observation has indicated that most of them work harder because they are dealing only with interesting material.

The goal which all of us seek, security from economic and other worries, is the reward given to most persistent and productive research workers. Elevated academic ranks, with consequent permanency of tenure, give to the time-tried investigator his haven of security.

It would seem then that both in attracting workers and in holding them, the financial motive plays an insignificant part. The prestige or rivalry motive, the desire to be accorded social recognition, is far superior to it in motivating scientific work. The urge to serve humanity is also stronger than selfish gain, as witness the tremendous efforts of health workers in the St. Louis epidemic of encephalitis.

Our modern mechanical marvel, the industrial age, has grown out of the efforts of a class which proves itself relatively uninterested in money. Yet money and profit have become the very gods of the machine age. It seems to me that it is high time our scientific workers exerted themselves to swing the minds of young people (and old) away from the idea of a profit system, and toward the idea of a system run for service. This would be the true scientific ideal, in contrast to our present crazy system in which valuable discoveries are suppressed because they will endanger somebody's profits if released. The discoveries of science should be used for the benefit of all.

PROBLEMS AND METHODS*

ROBERT E. COKER

It is my privilege to welcome you into the Society of the Sigma Xi, the Companions in Zealous Research. I would also congratulate you on having arrived—not at a goal, for it is not that, but at a milestone by the path of your progress in a career of research.

I have no idea how much or how little you know in your respective fields. The main thing is that you have acquired an interest, a genuine interest, a compelling interest in something. I say advisedly a *compelling* interest, because I hope and believe that you have an interest that will drive you inevitably, through prosperity or through adversity, for better or for worse, always to do something toward the advancement of knowledge and toward that betterment of life, physical, intellectual or moral, which ought to follow from a better understanding of the nature of things.

The next most important thing is that you have acquired a technique; for I take it that you have both the interest and a measure of the technique, or you would not be here tonight.

It may seem that I have misplaced the emphasis, that more stress should be laid on the amount of knowledge that you have striven for and have gained. Knowledge is good, but the mere storage of knowledge, without the zest and the daring to seek to increase it, is not what we stand for in the Society. Some knowledge is, doubtless, a prerequisite to interest: we cannot have a very lively or effective interest in something that we know nothing about; but, with interest or curiosity and with technique, the knowledge will surely follow by stages.

As to the relative position of interest and technique—if you have the best technique and no interest, you will not go far; if you have interest and no technique, you may perhaps gain the latter by hard labor and anguish of spirit in the course of time. It is really a great thing to have severe or even grilling exercise in the methods of scientific work. But, with regard to that, the best that can be said is that you have an *introduction* to methods, to technique. That is one thing that we are never passed the laboring for and acquiring: for it may well be emphasized that the main difficulties that confront us in the pursuit of scientific research are in finding out how to do things—in devising methods.

If a problem occurs to you, and the problems will arise if you have interest, if there is something you want to know but cannot find in the books, because no one knows it—you are faced with a problem for original research. Then the important question is—how can the problem be attacked?—a question of method. There probably are some problems that can be solved by going at them in just the same old way; but certainly the most notable achievements in science have been based on the application of new methods or new combinations of old methods.

* Address to new members and associates, North Carolina Chapter.

And the method may be simple enough in the conception and application, when you have it, but the use of it will still call for all the skill and all the discipline that you can command. Everyone wanted to know about heredity, but Gregor Mendel did more than think of the problem. He developed a method of approach to it—and such a simple one; almost anyone could have done it: hundreds of people today are doing just what Mendel did. Well, it may seem simple enough now, but no one else thought of it—either before Mendel or even for decades after him. But Mendel did even more than originate the method: he applied it, and in the application he brought to bear a high degree of skill, and, what is more, a rigorous intellectual discipline—far more of the latter quality than is required to follow a well-blazed trail. That is why we are so intebted to Mendel.

A few years ago some of us heard Professor Compton tell about his brilliant investigations of cosmic rays, by methods that he made to seem very simple, and we came away from the lecture almost ashamed that we had not thought to do those simple little things with a photo-electric cell, and thus casually explore the distant phenomena of the universe—and receive Nobel prizes. On second thought, however, it seemed possible that, even if we had in some miraculous way thought of the experiments that he performed, there might still have been something between us and the prize—something in the nature of the skill, the background of experience, the intellectual discipline, the clearness, vigor and assurance of thought—the qualities possessed in greater measure by Professor Compton than by some of the rest of us.

Well, I only wanted to emphasize the fact, that given the interest and the problem, the discovery of the method is the real beginning of the discovery of the facts or the principles, and also that it is only the beginning. From personal experience, I may assure you that you will think of many more problems than you will find methods of attacking. Many a good problem is spoiled by the use of a poor method, and many a good method is spoiled in the application—and that is worth considering and reconsidering.

But I must avoid making a short story long. I congratulate you upon your election to the Society of the Sigma Xi. I do not doubt that your affiliation with this organization will always be an occasion for pride and a source of stimulation, and that you will be an honor to the Society. May I give you the right hand of welcome.

THE SIGMA XI GRANTS-IN-AID

In 1921, Sigma Xi inaugurated a movement to give financial support to research work. Funds for this purpose were solicited from Sigma Xi alumni, that is, members and associates of the Society who are not connected with any chapters. The original plan was to make the award to one individual in the form of a fellowship and in general to applicants from fields which at that time were not covered by grants from the National Research Council. That plan was later modified and since 1924, grants-in-aid have been made in small amounts to several individuals each year and they have been applied either to personal expenses of the investigator, to expenses for assistants, publication, apparatus, etc.

During the first seven years of this part of the work of the Society, the expenses of collecting and administering the fund were born by the fund itself. This amounted to about $400 per year. In 1929 the convention voted to defray such expenses out of the general funds of the Society, so that every dollar contributed could be used for research.

The alumni committee, through its chairman, Mr. C. E. Davies (Rensselaer, 1914), now an officer of the American Society of Mechanical Engineers and residing in New York, issued in the first week in December the following letter to approximately 15,000 Sigma Xi members and associates scattered all over the world. Reports of returns will appear in successive issues of the QUARTERLY.

To Sigma Xi Alumni Members and Associates:

Since the Alumni Fund was started in 1921 over $30,000 has been contributed by 10,000 members of Sigma Xi for the aid of research. This sum distributed in modest grants to over seventy workers in science has done much to encourage research, and especially to stiffen their morale during times when support for science has of necessity been curtailed. The fund is now running low and the opportunity is being extended to all members of Sigma Xi to participate in this worthy cause which is doing so much good and is not being duplicated by any other research aid.

The fund typifies the spirit of Sigma Xi in that it is made up of small contributions that represent the sacrifice of the individual for the support of the workers in science. All the proceeds go for grants, none is spent in administration of collection.

The minimum desired from each member is $3.00, less will be welcomed and more can be used to great advantage. Send in the enclosed coupon with your check and in addition to the satisfaction, you will receive the QUARTERLY, that will bring you stimulating scientific reading as well as reports of the way your fund is spent.

(Signed) C. E. DAVIES,
Chairman, Alumni Committee.

IN MEMORIAM

KARL FREDERIC KELLERMAN

Dr. Karl Frederic Kellerman, bacteriologist and executive of the United States Department of Agriculture, died August 30, in Garfield Memorial Hospital, Washington, D. C., after a brief illness.

Doctor Kellerman joined the Federal Department of Agriculture as an associate physiologist in the Bureau of Plant Industry in 1901. His remarkable work in connection with the physiology of the lower plants, particularly with those many forms which are of such importance in their relation to our potable water supplies, in which field he was a pioneer, and his studies on nitrifying bacteria for which he developed a synthetic medium that is the foundation of all successful work in this field since that time, led to his rapid advancement, and in 1914 he was appointed assistant chief of the Bureau of Plant Industry. Three years later he was appointed associate chief of that Bureau.

In 1914, Doctor Kellerman was appointed to the Federal Horticultural Board, and served for ten years. Since that time he has been closely identified with the various regulatory phases of agricultural work, particularly as they were concerned with plant diseases. He organized the citrus canker work which was started in the Gulf Region in this country in 1915. In 1917 President Woodrow Wilson designated him as a member of the National Research Council. In 1929 he organized the phony peach eradication work. In the reorganization of the work of the Department in 1933 Doctor Kellerman took general charge of all of the regulatory work associated with plant diseases and also with the important campaigns in disease eradication, including the white pine blister rust work, the work on black stem rust and barberry eradication, and the work on the Dutch elm disease in the newly created Bureau of Entomology and Plant Quarantine.

In 1913 he organized the *Journal of Agricultural Research* and for ten years he was chairman of its editorial committee.

The Bureau of Entomology and Plant Quarantine will seriously miss his able direction of these lines of activity, says Lee A. Strong, chief of the Bureau.

Doctor Kellerman was born December 9, 1879, at Göttingen, Germany, of American parents. He came to America with his parents in 1880. He began his scientific career as an undergraduate student at Ohio State University in 1896. In 1900 he received the degree of Bachelor of Science from Cornell University. Immediately upon graduating he became assistant botanist at Cornell but only served in this capacity one year before coming to the Federal Department. In 1923, Kansas Agricultural College conferred upon Doctor Kellerman the degree of Doctor of Science for his meritorious work in plant physiology and pathology.

Doctor Kellerman possessed a dynamic personality and was actively associated with many phases of agricultural work. He was a Fellow of the American Association for the Advancement of Science; a member of the Washington Academy of Science; and the International Society of Soil

Scientists; he was also a member of the American Society of Agronomy; Society of American Bacteriologists; Botanical Society of America; the American Society of Naturalists; Biological Society of Washington, and the Botanical Society of Washington. He was a distinguished member of Sigma Xi.

Secretary of Agriculture Wallace has summed up Doctor Kellerman's career in these words: "With his death the world has lost an internationally known scientist whose contributions to agriculture have been a credit to the Department and whose loss will be keenly felt by friends and co-workers the country over."

PROF. WILLIAM H. ECHOLS

Prof. William Helding Echols, Jr., civil engineer and professor of mathematics at the University of Virginia for forty years, died late in September at his home in Charlottesville, Va.

Still active at the age of seventy-five in his work as head of the mathematics department of the university, Professor Echols had not had any warning of ill health. He died within an hour after a first attack of heart disease.

Professor Echols was the senior member of the university faculty, both from the standpoint of age and length of service with the institution.

He was born in San Antonio, Tex., on December 2, 1859, and attended the University of Virginia, receiving both the B.S. and C.E. degrees. He was successively in the years between 1883 and 1889 an assistant engineer for the Vicksburg, Shreveport & Pacific Railway, location and resident engineer for the Louisville, New Orleans & Texas Railway, a mining engineer and superintendent with the N. & O. Mining Company in Colorado, and the first resident engineer of the Memphis and Birmingham Railway.

He spent four years with the Missouri School for Mines at Rolla, both as a professor of mathematics and as its director.

He was elected an adjunct professor of mathematics at the University of Virginia in 1891 and in 1895 was made professor of the department which he headed at the time of his death. During his long life he wrote a number of papers on pure and applied mathematics and was the author of "Differential and Integral Calculus," a textbook having wide use.

Professor Echols was a charter member of the Virginia Chapter of Sigma Xi.

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